

ISOKINETIC ANKLE STRENGTH**TABLE OF CONTENTS**

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ISOKINETIC ANKLE STRENGTH

1. Background and rationale

Lower muscle strength is clearly associated with lower functional capacity in older adults. Data obtained in Health ABC indicate that lower isokinetic quadriceps strength is related to lower function. The strength of ankle dorsi and plantar flexors are related to balance and the incidence of falls. Ankle strength is also potentially related to peripheral neuropathy and to the prevalence of diabetes in Health ABC. Measures of ankle dorsi and plantarflexion will be obtained in Health ABC.

A Kin-Com isokinetic dynamometer will be used to evaluate the concentric strength of the ankle dorsi and plantar flexors. Isokinetic dynamometers test muscle performance as the participant applies force against a continuously moving mechanical arm. This is in contrast to isometric dynamometers, which require application of force against a fixed mechanical arm or lever. The Kin-Com is capable of testing a variety of muscle groups while the mechanical arm is moving at a variety of speeds. However, studies have found that muscle performance at one speed is highly correlated with performance at other speeds. We will test the performance of the ankle dorsi and plantar flexors at 60° per second.

To minimize time and participant burden, we will test the ankle on the right side only. We will test participants at 60° per second in the concentric mode to get an average of three acceptable trials for both dorsi and plantarflexion.

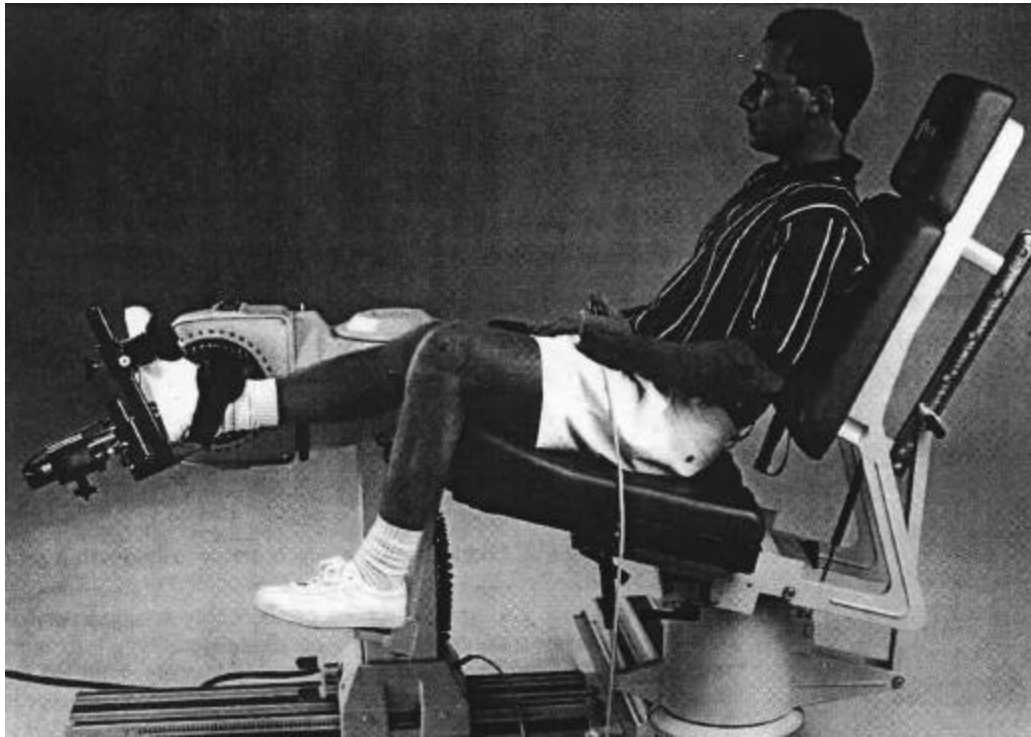
Note that the knee extension protocol was for one movement (extension) only, and the examiner pushed the lever arm back. For ankle strength, the participant will move the arm both forward and backward, testing ankle strength in two directions.

2. Equipment and supplies

- Kin-Com 125 AP Dynamometer
- Level with magnet
- Certified 5 kg (11 lb) weight with hook or handle and velcro strap for attaching weight to load cell
- Step stool, preferably with a handrail

2.1 Service and maintenance

Health ABC has contracted with the Chattanooga group for an extended service contract to cover the length of the study. Planned Maintenance inspections must be scheduled every six months. Regular service schedules must be strictly observed.



2.2 Calibration

See Appendix 1 for step by step calibration instructions. These should be followed once a week. Each clinic will have a certified 5 kg (11 lb) weight for calibration.

3. Safety issues and exclusions

The ankle test using the Kin-Com is generally safe and well tolerated by most older participants. However, injury may occur in participants with ankle or knee joint pathology or if the machine is operated incorrectly. To avoid injury during testing the mechanical hardware stops must always be in place when training or testing a participant. These pegs, attached to the Kin-Com dynamometer head, act as a backup to the manually determined software stop and start angles. The mechanical stops should be positioned 5° beyond the desired stop and start angles. Failure to place the stops properly may endanger the participant and damage the system. The patient

interrupt switch should always be in the participant's grasp during any activity on the Kin-Com. This switch enables participants to stop the lever from moving if they feel that speeds or forces are excessive.

Participants should not be tested on the dynamometer if they have any of the following conditions:

- History of cerebral aneurysm
- Cerebral bleeding within the past six months
- Blood pressure >199 / 109 mm Hg
- Ankle fusion or replacement

Unless contraindicated, the participant should be measured on the right leg. If a participant complains of pain during the test the test should be discontinued.

4. Participant and exam room preparation

The minimum space requirements for Kin-Com dynamometry is 9'x12', and a 12'x14' space is very comfortable.

Ideally, this test should be performed after a short period of warm-up exercise. The 20 meter walk is well-suited to this purpose and could be performed first.

5. Detailed measurement procedures

Health ABC will use the Kin-Com 125 AP dynamometer. This dynamometer has an automatic positioning feature that stores and recalls a participant's exact positioning and testing protocol from one examination to the next. This will include the testing speed to be performed at 60°/second. It is important for this longitudinal study that the methods of strength testing and the participant positioning be consistent throughout the study. Therefore, it is important that the position settings are recorded for each participant.

Step-by-step instructions for use of the Kin-Com for a participant who has been tested before with the same protocol can be found in Appendix 3. If a participant did not have a previous exam but can be measured now, follow the procedures in Appendix 4 (new participant).

5.1 Record keeping

A form is provided as a backup to the computer storage of patient positioning and for a summary record of isokinetic dynamometry testing performed on each participant. In addition, certain data are entered into the Kin-Com database via the keyboard. This includes participant name, gender, Health ABC Enrollment ID # (in the “physician” space in patient information), and the Staff ID of the examiner (in the “clinician” space). **It is important to complete all four of these fields to allow the participant to be positively identified in the data sent to the Coordinating Center for analysis.**

Record that the right leg is being tested. Record participant positioning parameters including lever arm length, how many trials were attempted, how many trials were accepted, peak torque, average torque, coefficient of variation, whether or not the test was performed, the date of the test, and the .CHA filename when the data are recorded.

Important: A printout of the report form should also be made immediately after each testing session and kept in the participant’s record in case of computer failure.

5.2 Administration

5.2.1 Determine contraindications or disabilities of right ankle

- 1) Check the blood pressure form to ensure that the participant’s sitting blood pressure does not exceed 199 systolic and 109 diastolic mm Hg. Record on Kin-Com Form.
- 2) If the participant indicates that they have suffered a cerebral aneurysm, record this on the Kin-Com form and do not continue. Testing is contraindicated in these participants.

Script: “Has a doctor ever told you that you have an aneurysm in the brain?”

- 3) If the participant indicates that they have suffered a cerebral hemorrhage in the past six months, record this on the Kin-Com form and do not continue. Testing is contraindicated in these participants.

Script: “Has a doctor told you that you had a cerebral hemorrhage (bleeding in the brain) in the last six months?”

4) Determine if the right ankle can be tested.

Script: “Have you ever had ankle surgery on your right leg where all or part of the ankle joint was replaced or fused?”

If not contraindicated, test the right leg.

5) Determine if one ankle is weaker than the other and if it is difficult for the participant to bend either of their ankles.

“Have you ever had an injury that has made one leg weaker than the other?”

If the participant answers “Yes,” ask them:

“Which leg is stronger?”

“Is it difficult for you to bend either of your ankles fully due to pain, arthritis, injury, or some other condition?”

If the participant answers “Yes,” ask them:

“Which ankle?”

Do not change which leg is tested based on the answers to these questions, but record the responses in the Year 5 Clinic Visit Workbook.

6) Determine whether the right ankle can be tested by using a simple manual test. Have the participant point their toes away from their shin (this is called plantarflexion) until the ankle is fully flexed. The tester asks the participant to bring the toes back up towards the shin (this is called dorsiflexion) and tests manually that the task is correctly understood.

Put hands on top of the participant’s foot and ask the participant to pull up with their toes against your hands. Keep your elbows extended and use the weight of your upper body to resist the pull.

After having tried the movement, the participant should be asked:

Script: “Did you have pain in your ankle that stopped you from pulling hard?”

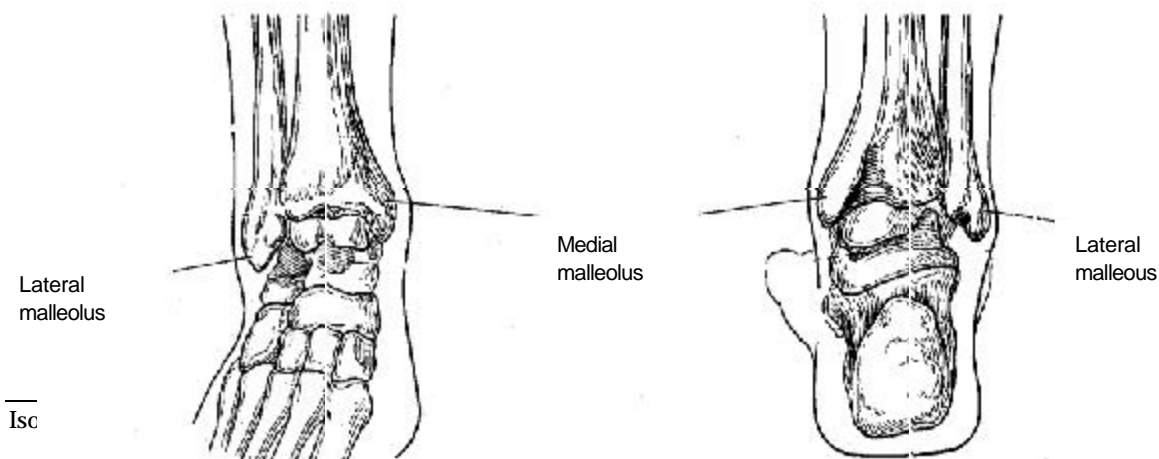
Record results of manual test on Kin-Com form. Do not test if the right leg can not be tested without excessive pain.

5.2.2 Positioning the participant on the Kin-Com

1) Participants are positioned sitting and with the back supported according to instructions. Stabilizing straps are placed across the pelvis and the distal thigh of the leg to be tested. Be sure the participant sits all the way back against the back of the chair and the stability straps are snug enough to prevent the participant from using other muscle groups to help the ankle flexors. At both sites (Memphis and Pittsburgh), the participant's left leg should rest on the footrest.

Script: “Now I would like you to sit in the chair with your hands comfortably in your lap. Please keep your hands in your lap during all testing.”

IMPORTANT: After positioning the participant, be sure to proceed to Manual Mode, then touch Index Location and check whether all positioning parameters including lever arm length are correctly entered, then touch Accept. Touch Enter to save this participant position and touch Yes when asked “Positional data for this patient/side/joint/movement exists. Do you want to overwrite?” **It is very important to follow these steps to ensure that all positioning parameters including lever arm length are correctly stored to allow later deletion of data files without loss of positioning information.** As a backup, lever arm length as well as all positioning parameters will be recorded on the exam form. Detailed step-by-step instructions for carrying out these important tasks are included in Appendix 3.



3) The ankle joint (medial malleolus [see figures above]) is aligned with the rotational axis of the dynamometer. This can usually be accomplished by adjusting the lever arm of the dynamometer up/down and in/out. Occasionally seat in/out adjustments must be made, particularly in very tall participants. The resistance pad on the foot holder apparatus at the end of the lever arm is placed on top of the foot just below the ankle bones (malleoli).

The Kin-Com automatically records any changes to the dynamometer positioning and seat that might have been changed while fine tuning the participant's positioning. The software will also prompt the operator to make any necessary changes to the dynamometer tilt (parameter A) and rotation (B); lever arm stops (C&D); and seat rotation (E), back angle (F), bottom depth (G), bottom angle (H), or lever arm length (I). These changes in the manual parameters must be read from the dynamometer and entered manually into the program so that future measurements can be standardized.

5.2.3 Test parameters

1) The computer joint angle is adjusted to anatomical joint angle by referencing the machine at 90° when the participant's ankle is plantar flexed at 90°. ¹ The machine reference angle must then be entered as 90° (see Appendix 3).

2) To correct for gravity, the participant's limb is weighed at approximately 51°. Weighing and gravity correction are covered in detail in Appendix 3.

3) Start and stop angles are set at 72° and 24°. Follow the instructions in Appendix 3. It is important that the start and stop angles be set correctly. Testing from 79° to 31° is not the same as testing from 72° to 24°.

¹ Note to investigators analyzing Kin-Com data: By setting anatomical joint angle based on machine joint angle, there may some error in the actual range of motion measured. This error may be the result of anatomical differences between participants so that the actual range of motion measured may not be 72° to 24°, although the range of motion will cover a 48° arc. In addition the seat angle (usually 15° above horizontal) and fore-aft distance will generally affect the true joint angle, and in turn affect the actual range of motion measured. The range tested may vary across participants. This should be taken into account when describing the Kin-Com protocol.

- 4) Start backward force (for plantarflexion) and start forward force (for dorsiflexion) are set at 5.
- 5) Test concentric repeatedly with a 20-second rest between each until three similar curves have been obtained, but no more than 6 attempts should be made.

5.2.4 Demonstration and practice

- 1) Participants should be given the interrupt switch to hold and instructed to use it if during the test they become apprehensive that the machine is pushing them too hard or they experience pain that makes them want to stop the test. In this case, pushing the switch will shut down all power to the Kin-Com and it will come to a soft stop.
- 2) Before testing, the starting forces will be set at 5 for both plantar and dorsiflexion (see Appendix 3).
- 3) Participants should perform two good submaximal practice efforts before testing begins. A good practice is based on the shape of the curve.

Script: “Now that you are all set up, I would like you to do a couple of practice tests. Push against the lever arm and keep pushing until it stops. I just want you to get the feel of it so you don’t need to push as hard as you can. If you experience any pain, tell me and we will stop or adjust the machine.”

- 4) If the participant complains of pain during the practice trials, determine how severe the pain is and whether testing should continue.

Script: “Does it hurt enough that you want to stop?”

If the participant complains of severe pain, discontinue testing.

5.2.5 Test

- 1) Once the participant has practiced the testing procedure, tell them that you will now begin the actual testing.

Script: “OK, this one is for real. I’d like you to push down with your foot until it stops. Whenever you are ready, push as hard as you can.”
(during the maneuver) “Harder, harder.”

2) When the participant has completed the first plantarflexion movement, allow a 5-second rest period, and then have them pull up with their toes (dorsiflexion) as hard as they can for the dorsiflexion effort. This will bring them back to their original starting position.

Script: “OK, I’d like you to pull up with your foot until it stops. Whenever you are ready, pull up as hard as you can.”

(during the maneuver) “Harder, harder.”

(after completion) “Now we’ll let you rest” [allow a 20-second rest period]

3) Starting with the second set of efforts, the Kin-Com will display the new test overlaid on the old test. If the two efforts “overlay” very consistently, both are accepted. Appendix 5 gives examples of acceptable and unacceptable overlays. If the efforts do not overlay consistently, the one with lower amplitude is discarded.

After each test effort, tell the participant whether the previous two curves were similar or whether the latest effort was an improvement or the effort had dropped off. This feedback will tend to encourage maximal effort on each test.

Concentric efforts are repeated until three similar curves have been obtained for both plantarflexion and dorsiflexion. The participant should not be asked to attempt more than six cycles. Keep track of the total number of attempts and the number of attempts “accepted.” These numbers should be noted on the exam form. **It is important to note that three curves will not be obtained for some participants. Only if at least three curves are obtained will a coefficient of variation (CV) be recorded on the form for either plantar or dorsi flexion. Thus, a CV may be recorded on the form for none, one or both ankle movements.**

With experience, it should be fairly easy to tell from the curves when the participant isn’t trying. If it appears that less than maximal effort is being exerted, encourage the participant to try harder. Emphasize the importance of the data to the study. However, if the participant complains of pain, ask if it hurts too much to push or pull full strength. Do not continue to test a participant with excessive pain.

If the participant is obviously fatiguing and efforts are decreasing in magnitude (each subsequent effort is lower than the previous) then after three or four attempts the test may be stopped.

The total number of trials accepted and stored (usually three) and the total number of trials attempted (accepted or rejected) should be recorded on the exam form. **If an**

exam was accidentally saved before the end, this should be noted on the exam form (checkbox) and the number of curves in the accidentally saved file recorded.

Occasionally there may be a participant who lacks the strength to do either the dorsiflexion (more likely) or the plantarflexion movement. If a participant cannot do one of these movements, first try again by setting the start force to the difficulty of “0.” Once the test is begun, and the participant attempts one of the motions (dorsi or plantarflexion) and still lacks the force necessary to create a curve, do not accept any of the curves, mark “Yes” to answer that the test was performed, cross off as each trial is completed, record how many trials were attempted, answer “No” to Question #2: “Were three curves accepted,” and record why not. Record “0” for Question #2b. “How many curves were accepted?” Record “0” for peak torque, “0” for average torque, and “Not applicable” for coefficient of variation. It is OK for the examiner to push the bar to complete the full range of motion in order to get to the other portion of the exam.

5.2.6 Diskette backup of data

Once a week, the data manager should make a copy of all data collected since the last backup in the study. The backup will be sent to UCSF monthly for downloading into the data system, and another copy should be maintained by the sites. The whole set of diskettes constitutes a complete backup of your Year 5 data. Detailed instructions for making a diskette back up are given in Appendix 6. In addition, a Kin-Com Data Transfer Form should be filled out and sent in with the data.

To determine which files to back up, the sites should keep a log of all Kin-Com exams done. Each time a backup diskette is made, the log entries corresponding to the exams copied to diskette should be marked to denote that they have been copied and sent to the Coordinating Center. All Year 5 exams should continue to be stored on the Kin-Com computer until the Coordinating Center directs you to delete them.

Note: Any practice sessions should be deleted before making the diskette to be sent to UCSF. In addition, any remaining Year 1, 2 or 4 exams should be deleted for each participant who has a Year 5 exam file. This will prevent the dataset from becoming overly large. Detailed instructions for deleting files are also included in Appendix 6.

6. Procedures for performing the measurement at home

This examination is not feasible for home visits.

7. Alert values/reporting to participants

When testing is completed, thank the participant without offering specific feedback on their performance.

8. Quality assurance

8.1 Training and certification

The Kin-Com manufacturer provided on-site training at one or both field centers, covering basic machine operation and the fundamentals of testing, as well as study-specific procedures. Operators should practice on other staff members and themselves until reliable measurements are achieved. It is especially useful to practice on volunteers who are not knowledgeable about what to expect. Training should include:

- observe measurement by experienced examiner
- read manufacturer's user's guide and Health ABC OM with goal of understanding
 - the proper use of equipment
 - the proper calibration and adjustment of equipment
 - exclusions and safety considerations
 - detailed testing procedures
- practice on colleagues and "naive" volunteers

8.2 Certification requirements

- Complete training requirements
- Recite exclusion criteria
- Demonstrate calibration and adjustment of Kin-Com
- Perform test on two volunteers under the observation of clinic QC officer or designated Kin-Com expert.

8.3 Quality assurance checklist

- ☐ Log indicates calibration according to schedule
- ☐ Blood pressure form checked to determine if testing contraindicated
- ☐ Manual test performed to determine pain exclusion
- ☐ Participant positioning correctly determined (by fine tuning in the manual mode)
- ☐ Index Location checked and patient positions re-saved for each participant
- ☐ Manual hardware stops in place
- ☐ Patient interrupt switch in participant's hand during demonstration and testing and its operation properly explained
- ☐ Gravity correction correctly applied (leg weight is stable)
- ☐ Correct instructions given while demonstrating procedure
- ☐ Two good submaximal practice efforts for each movement (dorsi and plantarflexion)
- ☐ Standard level of encouragement (motivation and feedback) offered to participant
- ☐ Correct determination of trials to be stored (based on overlay with previous trials)
- ☐ For both dorsi and plantarflexion, three successful trials stored or a maximum of six trials attempted after good practice efforts
- ☐ Key points from script stated and clearly delivered
- ☐ Data saved to Kin Com file
- ☐ Total number of trials and number of accepted trials noted on exam form
- ☐ Report printed and placed in participant's file
- ☐ Reviews form for completeness
- ☐ Form correctly filled out

9. References

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APPENDIX 1 Kin-Com Calibration Procedure**Part I
Diagnostics**

From the Kin-Com Main screen: Touch screen anywhere

1. Select Kin-Com
2. Select System Utilities
3. Type: test
4. Type: yes
5. Select option 1
6. Select option 1
7. Position mechanical stop C at 2; mechanical stop D at 34
8. Make sure the load cell is firmly attached to the lever arm.
9. Position lever arm in approximately the horizontal position and pick up the patient abort switch.
10. MAKE SURE THE LEVER ARM IS UNOBSTRUCTED AND WILL NOT CONTACT ANY OBJECT! The lever arm will be moved passively throughout the full range of motion of the machine. This will be done at various speeds including full speed (250+ degrees per second). DO NOT STAND CLOSE ENOUGH TO BE STRUCK BY THE LEVER ARM DURING THIS PROCEDURE. During the Diagnostic check the software will actuate the lever arm several times and at several speeds. Do not get in the path of the lever arm until you have completed the Diagnostic check and have safely returned to the Kin-Com software.
11. Press Enter and the Diagnostics program will run.
12. Press the Patient abort switch when requested.
13. When the message Diagnostics program complete appears, press escape.
14. Press escape repeatedly until you return to the main menu.
15. This concludes the Diagnostic portion of the calibration procedure. If any problems were encountered during diagnostics, they would be reported on the screen. If problems are encountered, call service at 800-494-3398.

**Part II
Load Cell**

If the Kin-Com is not already set up for measuring the right leg, do so before beginning the load cell calibration.

From the Kin-Com Main screen: Touch screen anywhere.

1. Select Kin-Com

2. Select Exercise
3. Select Protocol
4. Select Calibration
5. Select Continuous
6. Select Turn On Anatomical Reference
7. Move lever arm to horizontal and check with a level.
8. Select Enter
9. Actual joint angle is: 0; Select Enter
10. Grasp the load cell, **not the lever arm**, and move lever arm down a few degrees towards vertical.
11. Select Enter
12. Select Enter
13. Grasp the load cell, **not the lever arm**, and move the lever arm up towards horizontal until Stop Angle = 0.
14. Select Enter
15. Select Set Start Angle
16. Grasp the load cell, **not the lever arm**, and move the lever arm down towards vertical until Start Angle = 90
17. Select Enter
18. Select Enter
19. Force should read zero.*
20. Select Start Exercise.
21. Pull up on load cell for about one second.
22. Place a known weight (11 lb or 5 kg) on the load cell. This is most easily done by attaching the weight to the load cell with a velcro strap.
23. Force should read 50 Newtons**
24. Remove weight.
25. Select Escape

*If the reading flickers back and forth between +1 or -1 and 0, this may be as close as you can get. If force does not flicker between 0 and +/- 1 or read zero with lever arm vertical, remove cover from Kin-Com, find the decal on the computer that shows the location of pot #7 force gain and #8 force zero adjustment (offset). With the lever arm vertical, adjust the zero adjustment screws until force reads zero.

** If force reading does not read 50 Newtons in the horizontal position with the 11 lb (5 kg) weight attached, adjust #7 (gain) until it reads 50 Newtons. Calibration is complete.

APPENDIX 2 Health ABC Kin-Com Overlay Test Protocol – Repeat Participant

- Power-up the Kin-Com.
- Touch the screen anywhere to Enter the Kin-Com Main menu.
- Touch Kin-Com to access the main menu.
- Touch Patient Positions.
- Touch Preset Position.
- Touch joint: Ankle.
- Touch Dorsi/Plantarflexion .
- Touch side: Right.
- Touch the screen anywhere.
- Follow on-screen instructions to position the unit in the standard preset position for ankle plantar dorsi flexion.
- Place participant on machine and secure stabilization straps
- Touch the screen anywhere to proceed to Manual Mode for fine tuning adjustment for this participant.
 - Once manual positions A-H are set up for this protocol, they should not be changed. The correct positions for this protocol are:
 - A Dynamometer tilt: 180
 - B Dynamometer rotation: 180
 - C Lever arm green C stop: 28
 - D Lever arm red D stop: 5
 - E Seat rotation: 0
 - F Seat back angle: 60
 - G Seat bottom depth: 3
 - H Seat bottom angle: 15
- In most cases, the lever arm will be 32. If adjustments to the lever arm length are necessary, make the adjustments, then **touch Index Locations**. Make sure the lever arm length is correctly entered. (Note: You will have to position the participant's foot in the footrest to verify this measurement).
- Make sure that the strap on top of the foot is fairly tight and that the hand screw on the side of the footrest is tightened to hold the front of the foot firmly in place.
- The seat fore-aft position should be manually adjusted so that the knee is slightly bent at a 55-60° angle. Use the goniometer to measure this joint angle.
- Use the arrow buttons on the keyboard to move the highlight bar to the appropriate position(s). Type in the new number(s) and touch Accept.
- **Touch Enter to save this Participant position.**
- A scroll box will appear that says "Positional data for this patient/side/joint/movement exists. Do you want to overwrite?" **Touch Yes.**

- ___ Touch escape once.
 - Touch Evaluation to access the evaluation program.
 - The patient scroll box will be displayed, select the appropriate participant's name.
 - Touch Enter to accept this participant.
 - Review Patient Information. **NOTE: if any information was omitted at the first visit, it may be entered now (e.g., Health ABC Enrollment ID #, etc). If a different examiner is conducting the exam at Visit 5 than at Visit 4, the staff ID ("Clinician") should be corrected.** If no changes need to be made, touch Enter.
 - A blue message box will display: You will need the following attachments:
"Ankle plantar/dorsi" (you already have it)
 - Touch Turn ON Gravity Compensation.
 - Move Lever Arm to horizontal position (Check with a level).
 - Touch Enter (you will get the joint specification screen again)
 - Touch Enter
 - Touch Protocol
 - Select the ANKLE (i.e., touch Enter).
 - Touch Overlay.
 - Set stop C to 25.
 - Set Lever arm length:
The correct lever arm length should be displayed.
Move the load cell to the displayed length.
 - Touch Enter.
 - Set anatomical reference.
 - Select joint position; move lever arm to vertical position (pointing down, check with a level)
 - Touch Enter to record mechanical position of the lever arm at 90°.
 - Enter Actual joint angle; 90.
 - Touch Enter.
 - Move joint angle positive.
 - Move the knee towards flexion.
 - Press Enter to record the direction as positive.
 - Press Enter to advance to the next screen.
 - Move Lever Arm to Current angle: =51° for Right ankle.
 - Move mechanical stop C to 30; touch Enter.
 - Screen will show current angle close to 51 degrees, touch Enter
- *
- With the participant's foot firmly attached to the footrest, ask them to relax.
 - When the weight reading stabilizes, touch Enter.
 - Limb weight will be displayed.

- Ask the participant to contract and then relax their leg and repeat from *
- If your weight readings agree, press enter, otherwise repeat again until you have a reading you think is accurate
- Touch Enter
- Set Stop angle:
 - A blue box will display last angle of 24 degrees.
 - Grasp the **load cell** and move the footrest to 24 degrees. The blue box will turn red when you get to 24 degrees. (It also turns red at 23 and 25; make sure it is on 24 before you press Enter
 - Press Enter to record stop angle.
- Move mechanical stop C back to 28, and D to 5.
- Set start angle:
 - A blue box will display last angle of 72 degrees.
 - Grasp the load cell and move the lever arm to 90 degrees. The blue box will turn red when you get to 90 degrees. (It also turns red at 89 and 91; make sure it is on 90 before you press Enter)
 - Press Enter to record the start angle and advance to the next screen.
- Set Concentric Activation Force:
 - Select Change, then Force Limits, then Start Forward Force.
 - Enter 5 for the dorsal test, then hit Enter
 - Select Start Backwards Force
 - Enter 5 for the plantar test, then hit enter
 - Select Return to Test
- Touch Start Measure
 - Ask participant to push down with their foot with less than maximal effort for practice. When lever arm stops, touch No.
 - Touch Start Measure
 - Then ask the participant to pull up with their foot. When lever arm stops, touch No.
 - Touch Start Measure
- Repeat both practice efforts at less than maximal effort.
 - Touch Start Measure
 - Ask participant to push down with their foot with less than maximal effort. When lever arm stops, touch No.
 - Then ask the participant to pull up with their foot. When lever arm stops, touch No
- Allow the participant 20 seconds before starting the real test or repeating the practice test. Participants should perform two good practices for each movement (dorsi and plantarflexion)(based upon shape of curve) before testing begins.
- Touch Start Measure to begin recording data for the first concentric effort.

- Tell the participant to push down with their foot as hard as possible until the lever arm stops.
- Always Touch Yes to accept the initial concentric effort.
- Touch Start Measure
- Then ask the participant to pull up with their foot as hard as possible until the lever arm stops.
- When lever arm stops, touch Yes
- Wait 20 seconds.

NOTE: If the screen scale is too compressed (or too expanded), you should change it by touching Screen Display, then Scale, then Force. Press the up arrow to compress the scale, down arrow to expand it. Use the down arrow until the top of the curve disappears off the screen, then touch the up arrow once to bring the curve back down to maximally expanded scale. This will allow the most accurate comparison of curve overlays and enable you to see the wobbles that indicate that the participant is experiencing pain.*

- Touch Start Measure to begin recording data for the second set of concentric efforts.
 - As data for the second efforts is recorded it will be displayed in blue over the previously collected initial effort (in green). If the two efforts overlay very consistently, then Touch Yes to accept latest effort and Touch Yes to accept previous effort. This will average the two efforts together.
 - If the latest effort is greater in amplitude, Touch Yes to latest and No to previous. This will save the latest effort and delete the previous.
 - If the latest effort is of lower amplitude than the previous, Touch No to latest and it will be deleted.
- Continue in this fashion until three concentric curves have been accepted.
- Touch Save to save data. (Button will change from 0 to 1)
- Touch Escape three times to return to the main menu.
- Touch Reports
- Touch Overlay
- Touch Compare Report
- Select Patient, Enter.
- Select date, Enter
- Select test 1, enter
- Select test 2, Enter
- Enter

NOTE: The report scale can also be changed by touching Scale, then entering a new scale value (lower numbers give a more expanded scale, higher give a more compressed scale. You will have to enter the new scale value twice).

* The default value can be changed permanently by pulling up the Health ABC protocol, selecting "select scale" and changing it to the desired value (50 is suggested). Then select "save" to save the protocol.

- Touch Print, Enter
- Touch Enter twice, report prints.

APPENDIX 3 Health ABC Kin-Com Overlay Test Protocol – New Participant

- Power-up the Kin-Com.
- Touch the screen anywhere to Enter the Kin-Com Main menu.
- Touch Kin-Com to access the main menu.
- Touch Patient Positions.
- Touch Preset Position.
- Touch joint: Ankle.
- Touch Dorsi/Plantarflexion .
- Touch side: Right.
- Touch the screen anywhere.
- Follow on-screen instructions to position the unit in the standard preset position for ankle plantar dorsi flexion.
- Place participant on machine and secure stabilization straps
- Touch the screen anywhere to proceed to Manual Mode for fine tuning adjustment for this participant.
 - Once manual positions A-H are set up for this protocol, they should not be changed. The correct positions for this protocol are:
 - A Dynamometer tilt: 180
 - B Dynamometer rotation: 180
 - C Lever arm green C stop: 28
 - D Lever arm red D stop: 5
 - E Seat rotation: 0
 - F Seat back angle: 60
 - G Seat bottom depth: 3
 - H Seat bottom angle: 15
- In most cases, the lever arm will be 32. If adjustments to the lever arm length are necessary, make the adjustments, then **touch Index Locations**. Make sure the lever arm length is correctly entered. (Note: You will have to position the participant's foot in the footrest to verify this measurement).
- Make sure that the strap on top of the foot is fairly tight and that the hand screw on the side of the footrest is tightened to hold the front of the foot firmly in place.
- The seat fore-aft position should be manually adjusted so that the knee is slightly bent at a 55-60° angle. Use the goniometer to measure this joint angle.
- Use the arrow buttons on the keyboard to move the highlight bar to the appropriate position(s). Type in the new number(s) and touch Accept.
- Touch Enter to save this as a Participant position.
- A patient scroll box will be displayed. Select New Patient and enter all appropriate data. **This includes entering the Health ABC Enrollment ID # in the space for physician and the examiner's Health ABC staff ID in the space for clinician.**

- Touch Enter to accept, or Re-do to make changes.
 - A blue message box will display: “Adding positional data to the Patient Position Database.”
 - Touch screen anywhere to continue.
 - Touch Evaluation to access the evaluation program.
 - The patient scroll box will be displayed. Select New Patient and enter all appropriate data.
 - Touch Enter to accept this participant.
 - A blue message box will display: You will need the following attachments: “Ankle plantar/dorsi” (you already have it)
 - Touch Turn ON Gravity Compensation.
 - Move Lever Arm to horizontal position (Check with a level).
 - Touch Enter (you will get the joint specification screen again)
 - Touch Enter
 - Touch Protocol
 - Select the ANKLE (i.e., touch Enter).
 - Touch Overlay.
 - Set stop C to 25.
 - Set Lever arm length:
The correct lever arm length should be displayed.
Move the load cell to the displayed length.
 - Touch Enter.
 - Set anatomical reference.
 - Select joint position; move lever arm to vertical position (pointing down, check with a level)
 - Touch Enter to record mechanical position of the lever arm at 90°.
 - Enter Actual joint angle; 90.
 - Touch Enter.
 - Move joint angle positive.
 - Move the knee towards flexion.
 - Press Enter to record the direction as positive.
 - Press Enter to advance to the next screen.
 - Move Lever Arm to Current angle: =51° for Right ankle.
 - Move mechanical stop C to 30; touch Enter.
 - Screen will show current angle close to 51 degrees, touch Enter
- *
- With the participant’s foot firmly attached to the footrest, ask them to relax.
 - When the weight reading stabilizes, touch Enter.
 - Limb weight will be displayed.
 - Ask the participant to contract and then relax their leg and repeat from *

- If your weight readings agree, press enter, otherwise repeat again until you have a reading you think is accurate
- Touch Enter
- Set Stop angle:
 - A blue box will display last angle of 24 degrees.
 - Grasp the **load cell** and move the footrest to 24 degrees. The blue box will turn red when you get to 24 degrees. (It also turns red at 23 and 25; make sure it is on 24 before you press Enter
 - Press Enter to record stop angle.
- Move mechanical stop C back to 28, and D to 5.
- Set start angle:
 - A blue box will display last angle of 72 degrees.
 - Grasp the load cell and move the lever arm to 90 degrees. The blue box will turn red when you get to 90 degrees. (It also turns red at 89 and 91; make sure it is on 90 before you press Enter)
 - Press Enter to record the start angle and advance to the next screen.
- Set Concentric Activation Force:
 - Select Change, then Force Limits, then Start Forward Force.
 - Enter 5 for the dorsal test, then hit Enter
 - Select Start Backwards Force
 - Enter 5 for the plantar test, then hit enter
 - Select Return to Test
- Touch Start Measure
 - Ask participant to push down with their foot with less than maximal effort for practice. When the lever arm stops, touch No.
 - Touch Start Measure
 - Then ask the participant to pull up with their foot. When lever arm stops, touch No.
 - Touch Start Measure
- Repeat both practice efforts at less than maximal effort.
 - Touch Start Measure
 - Ask participant to push down with their foot with less than maximal effort. When lever arm stops, touch No.
 - Then ask the participant to pull up with their foot. When lever arm stops, touch No
- Allow the participant 20 seconds before starting the real test or repeating the practice test. Participants should perform two good practices for each movement (dorsi and plantarflexion)(based upon shape of curve) before testing begins.
- Touch Start Measure to begin recording data for the first concentric effort.

- Tell the participant to push down with their foot as hard as possible until the lever arm stops.
- Always Touch Yes to accept the initial concentric effort.
- Touch Start Measure
- Then ask the participant to pull up with their foot as hard as possible until the lever arm stops.
- When lever arm stops, touch Yes
- Wait 20 seconds.

NOTE: If the screen scale is too compressed (or too expanded), you should change it by touching Screen Display, then Scale, then Force. Press the up arrow to compress the scale, down arrow to expand it. Use the down arrow until the top of the curve disappears off the screen, then touch the up arrow once to bring the curve back down to maximally expanded scale. This will allow the most accurate comparison of curve overlays and enable you to see the wobbles that indicate that the participant is experiencing pain.*

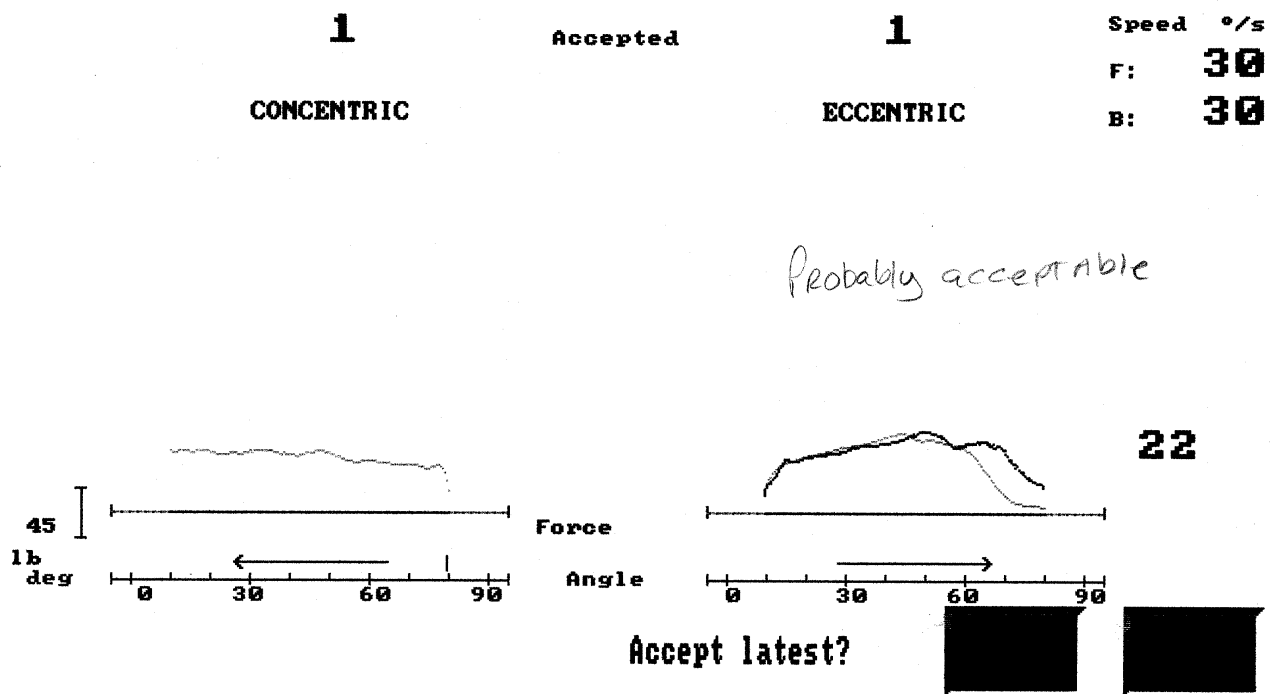
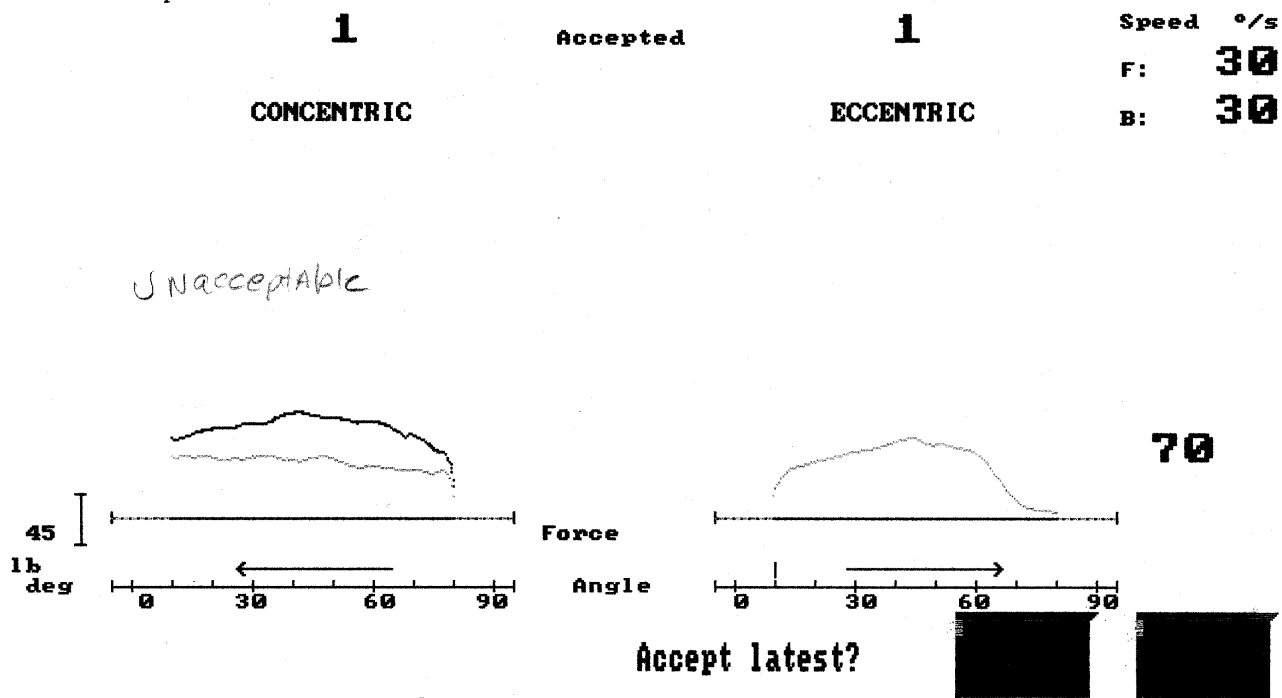
- Touch Start Measure to begin recording data for the second set of concentric efforts.
 - As data for the second efforts is recorded it will be displayed in blue over the previously collected initial effort (in green). If the two efforts overlay very consistently, then Touch Yes to accept latest effort and Touch Yes to accept previous effort. This will average the two efforts together.
 - If the latest effort is greater in amplitude, Touch Yes to latest and No to previous. This will save the latest effort and delete the previous.
 - If the latest effort is of lower amplitude than the previous, Touch No to latest and it will be deleted.
- Continue in this fashion until three concentric curves have been accepted.
- Touch Save to save data. (Button will change from 0 to 1)
- Touch Escape three times to return to the main menu.
- Touch Reports
- Touch Overlay
- Touch Compare Report
- Select Patient, Enter.
- Select date, Enter
- Select test 1, enter
- Select test 2, Enter
- Enter

NOTE: The report scale can also be changed by touching Scale, then entering a new scale value (lower numbers give a more expanded scale, higher give a more compressed scale. You will have to enter the new scale value twice).

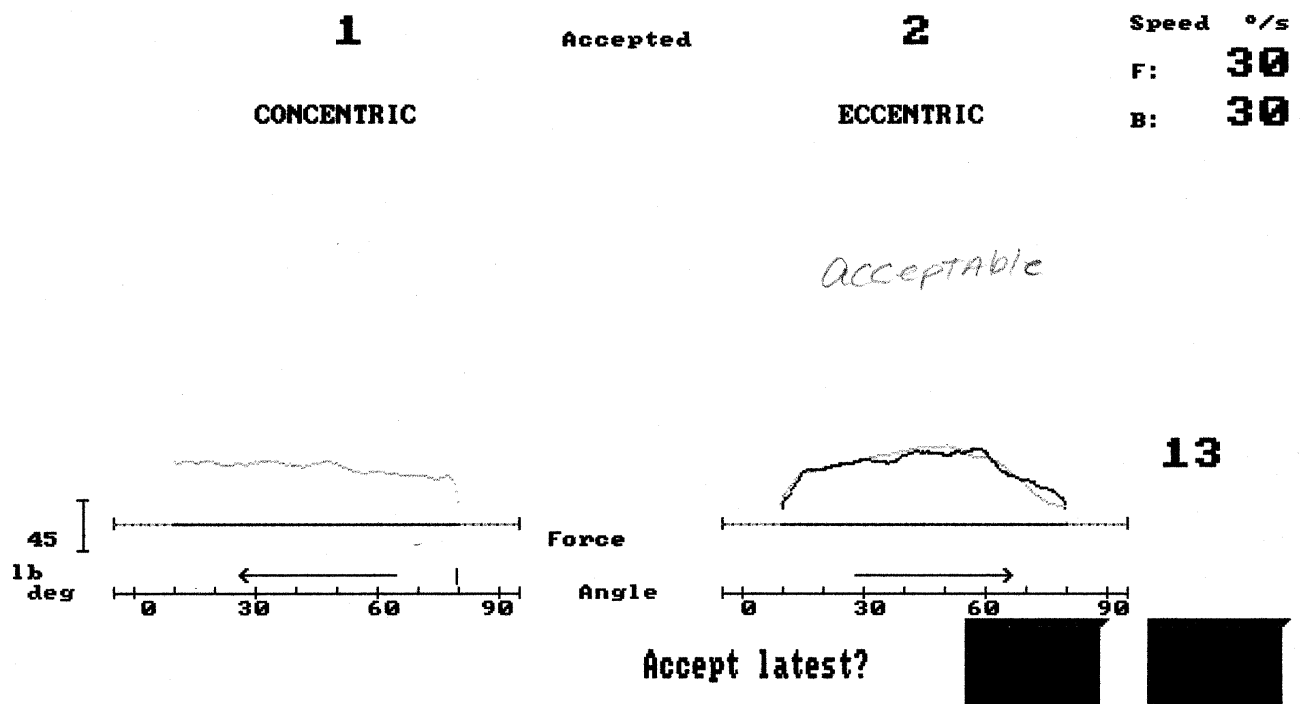
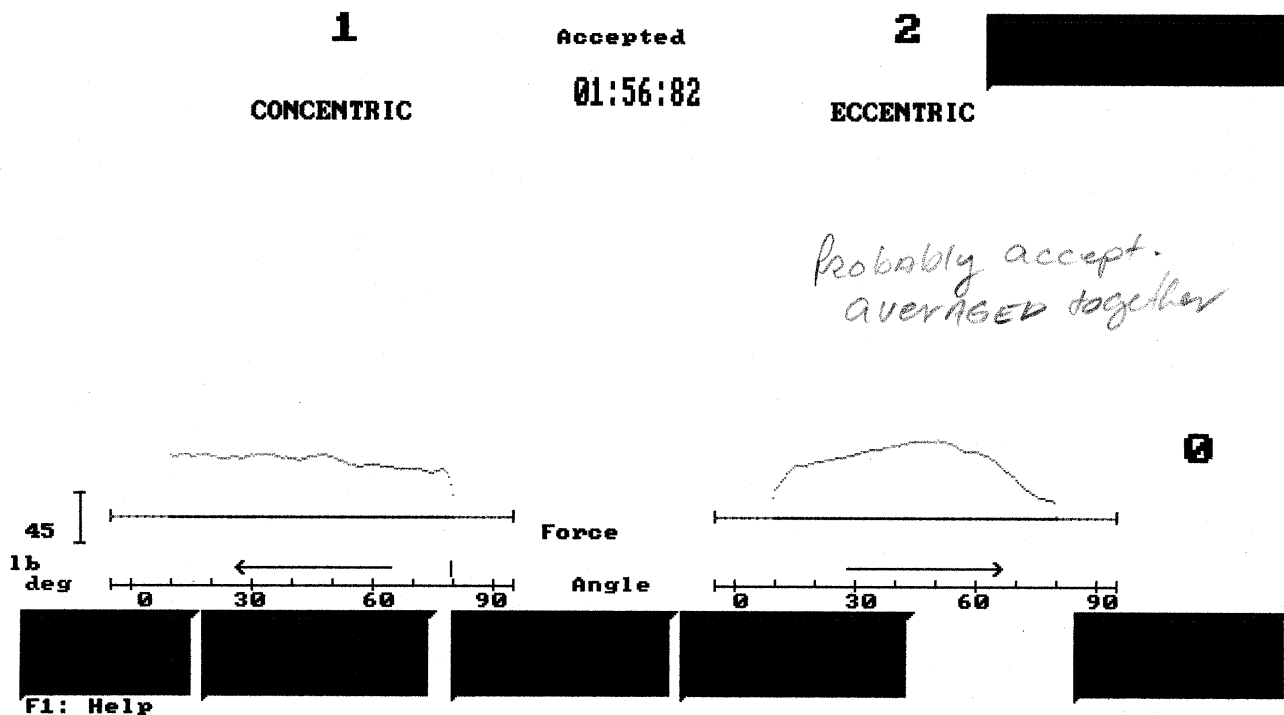
* The default value can be changed permanently by pulling up the Health ABC protocol, selecting "select scale" and changing it to the desired value (50 is suggested). Then select "save" to save the protocol.

- Touch Print, Enter
- Touch Enter twice, report prints.

APPENDIX 4 – Acceptable and Unacceptable Overlays
(page 1 of 2)



APPENDIX 4
(page 2 of 2)



APPENDIX 5 Protocol for Diskette Backup

First erase any practice sessions for Year 5.

- Touch Kin Com
- Touch Utilities
- Touch System Utilities
- Touch Erase Data Files
- Scroll down the list of participants* to the first file you wish to delete. With file highlighted, touch Enter Tag. A check mark will appear next to the file. If you check the wrong file, touch Enter Untag. The check mark will disappear.
- Scroll down to next file you wish to delete and repeat the process until all practice sessions and extra files are check marked.
- Touch Erase Selected Files.
- Touch Escape to exit System Utilities.
- Touch Database Utilities
- Touch Delete Patient Positions
- Go to each practice patient and touch Enter. The screen will show which tests (e.g. right knee) have been done on that participant and ask you to indicate which test position you want to delete. If there are more than one, scroll to the position(s) you want to delete, then touch Enter. The system will ask if you really want to delete this patient's positions. Touch Yes. Do not erase patient positions for real Health ABC participants.
- Touch Escape several times until you return to the main menu

Finally, using your Kin-Com log as a guide, make an archive copy of all new data to be sent to the Coordinating Center (see instructions above). Make a second diskette copy for your own archives. Keep the backup tape to reuse the next time you archive your data.

- Touch Kin Com
- Touch Utilities
- Touch System Utilities
- Touch Copy Data Files
- Touch Copy Files from C: to A:
- Scroll down screen, tagging each file to be copied (use your log to determine which have not yet been archived). With file highlighted, touch Enter Tag. A check mark will appear next to the file. If you check the wrong file, touch Enter Untag. The check mark will disappear.
- When all files to be archived have been tagged, touch Copy Selected Files
- Wait until copying process is complete (this may take some time)
- Touch Escape three times
- Touch Utilities

- Touch Database Utilities
- Touch Rebuild Database (this may take a long time)

APPENDIX 6 Kin-Com Data Transfer Form



KIN-COM DATA TRANSFER

To:	Hilsa Ayonayon UCSF- Prevention Sciences Group 74 New Montgomery St., Suite 600 San Francisco, CA 94105 (415) 597-9268
From:	_____
Staff ID#:	<input type="text"/> <input type="text"/> <input type="text"/>
Field Center:	<input type="checkbox"/> Memphis <input type="checkbox"/> Pittsburgh
Telephone #:	(<input type="text"/> <input type="text"/> <input type="text"/>) <input type="text"/> <input type="text"/> - <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Dates data backed-up onto diskette:	From: <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Month Day Year To: <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Month Day Year
Comments:	_____ _____ _____ _____

UCSF Coordinating Center Use Only:

Date diskette received:

 / /

Comments:

Kin-Com Data Transfer 5/12/00 pjw